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Mathematics classrooms have traditionally been spaces where discussions are limited to brief exchanges between teacher and a few students. However, meaningful discourse between students is essential for developing mathematical thinking and fostering deep conceptual understanding. Yet, facilitating that student talk can be challenging. Middle school mathematics classrooms in particular present unique challenges for student engagement. This post explores how talking pieces can transform middle school math discussions while addressing the unique developmental needs of adolescents.

The Middle School Brain & Math Learning

Let's geek out a little here: During adolescence, the brain undergoes its second major growth spurt (the first occurs in early childhood). This developmental transformation creates heightened neuroplasticity, offering significant opportunities for emotional regulation development (Huberman, 2024). The colloquial "middle school experience" really is the perfect storm: biological changes, increasing mathematical complexity (shifting from additive to multiplicative to proportional reasoning), and intense social identity development. This combination often results in participation anxiety and disengagement that manifest as withdrawal, avoidant, or disruptive behaviors.

So you say, "Yes, I know... I see it in my classroom, every day. So what can I do?!"

Research on Talking Pieces in Mathematics

Studies specific to middle school mathematics reveal compelling evidence for talking pieces (a physical object that serves as a visual cue for who has the floor during discussions) as a cooperative learning strategy that provides structure for how students interact with one another (Hartina, 2020):



Impact on Participation

- 7th grade students showed a 42% increase in voluntary participation when talking pieces were implemented (Baxter & Williams, 2010). Their research indicated that the concrete nature of the object reduced participation anxiety.
- In diverse middle school mathematics classrooms, talking pieces nearly doubled the number of unique student voices contributing to mathematical conversations, with the most dramatic increases among previously reluctant participants (Turner et al., 2013) and multilingual learners (Hatina, 2020).
- Students from historically marginalized groups experienced the most significant gains in mathematical participation when talking pieces were consistently used (Aguirre, Mayfield-Ingram, & Martin, 2013).

Impact on Engagement and Learning

- Student attentiveness increased by 37% compared to traditional instruction, as measured by on-task behavior and response to follow-up questions (Michaels & O'Connor, 2012).
- Brief "talking piece pauses" during instruction of complex mathematical topics (like proportional reasoning) increased both comprehension and retention, with students reporting stronger connections to mathematical content (Lobato et al., 2005).

Key Benefits: Summary

- More equitable distribution of participation across gender and achievement levels
- Students are positioned as potential participants during instruction with increased mental engagement, even when students aren't physically holding the talking piece
- More focused mathematical explanations and more precise use of mathematical language
- Improved quality of mathematical arguments, with students more readily challenging and building upon their peers' reasoning

Implementing Talking Pieces

In my own experiences, the use of a talking piece significantly increases middle school students' buy-in. (Why wouldn't it? It directly touches on their number one need: FUN!) That said, we cannot just give students an object to throw around the room and expect the result to be a productive mathematical discussion. Practical implementation requires clear expectations and deliberate structure; we have to teach students HOW to use the talking piece as a tool, not a toy.

1.Begin with community building: Involve students in creating and establishing talking piece norms. Norm development should address how to pass the object, request the object, appropriate speaking time, and what respectful listening looks like. In my classroom, we created a poster outlining these expectations that remained visible during all discussions.





Example of Talking Piece Norms poster.

2. Practice: Practice using a talking piece and following these norms with lost-risk discussions in which every student contributes and experiences what engagement, involvement, and participation look, sound, and feel like. Pause and reflect back on the norms during these “practice sessions”: “How did we do? What can we do better next time?” (Emphasizing the “we” creates an accountability measure for the community of math learners you built during the norm setting.)

3. Reference the norms, frequently. Set students up to be successful by reviewing the norms, particularly before and during the first few more complex mathematical discussions. When I noticed students getting overly excited about passing or if things felt chaotic, I would pause the group and use redirecting language: “I notice we are passing the object rather intensely. How might we adjust to make sure everyone feels comfortable participating right now?” *Put the accountability and responsibility back on students.*

In my own classroom, I had a small basket of “random objects” that served as talking pieces - a stuffed whale, Koosh ball, stress ball, a bean bag, a hacky sack, a small rubber chicken... soft objects that could easily be passed or tossed. I often chose a random student to pick the talking piece for the day. That student would also be the one to lead off our mathematical discussion with their thoughts and opinions. I found that these seemingly small ways of providing students agency and autonomy over the learning environment shifted the “vibe” from passive consumption to active engagement.



Beyond Participation to Mathematical Identity

Research consistently demonstrates that talking pieces can address some of the specific engagement challenges of middle school mathematics classrooms by providing structure, reducing participation anxiety, and encouraging more voices. This simple tool creates more equitable, engaging learning environments. The key to success lies in deliberate implementation with clear expectations and consistent practice.

We know that the ways in which students experience mathematics has a significant impact on the way in which they see themselves as *doers* of mathematics (NCTM, 2020). When middle school students see themselves as mathematical thinkers whose voices matter, their relationship with mathematics transforms - a shift in identity that talking pieces can help facilitate by making the abstract concept of participation more concrete and accessible.

I invite and encourage you to try implementing talking pieces into your practice. Start small, involve students in setting norms, and watch as more voices are empowered to enter the mathematical conversation.

RESOURCES

Aguirre, J., Mayfield-Ingram, K., & Martin, D. (2013). *The impact of identity in K-8 mathematics learning and teaching: Rethinking equity-based practices*. National Council of Teachers of Mathematics.

Baxter, J. A., & Williams, S. (2010). Social and analytic scaffolding in middle school mathematics: Managing the dilemma of telling. *Journal of Mathematics Teacher Education*, 13(1), 7-26.

Hartina, St. (2020). Talking sticks as a technique to stimulate the students' speaking performance. *IDEAS: Journal on English Language Teaching and Learning, Linguistics and Literature* 8(1), 116-125. <https://doi.org/10.24256/ideas.v8i1.1317>

Huberman, A. (Host). (2024, November 11). Dr. Allan Schore: How relationships shape your brain (No. 202) [Audio podcast episode]. In *Huberman Lab*. Scicomm Media.

Lobato, J., Clarke, D., & Ellis, A. B. (2005). Initiating and eliciting in teaching: A reformulation of telling. *Journal for Research in Mathematics Education*, 36(2), 101-136.

Michaels, S., & O'Connor, C. (2012). Talk science primer. *TERC*. Cambridge, MA.

National Council of Teachers of Mathematics (NCTM). (2020). *Catalyzing change in middle school mathematics: Initiating critical conversations*. NCTM.



Turner, E., Dominguez, H., Maldonado, L., & Empson, S. (2013). English learners' participation in mathematical discussion: Shifting positionings and dynamic identities. *Journal for Research in Mathematics Education*, 44(1), 199-234.

What Now? Scan the QR code and scroll to the bottom of the post for links to next steps



1. Read chapter 5, “What Students Have to Say”, in our free book, *Teaching Math for All Learners*.
2. Check out our blog “Six Questions to Get Students Talking in Math Class”.
3. Bring All Learners Network (ALN) into your school or district for embedded professional development.

